WHAT IS CLAIMED IS:

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1. An automatic white balance adjustment method, comprising the steps of:

(a) determining a luminance level of a subject;

(b) dividing an image plane, on which the subject is imaged, into a plurality of areas;

(c) acquiring color information of each of the areas;

(d) setting at least one determination frame indicating at least a color distribution range of a light source;

(e) finding a number of the areas belonging to the determination frame in accordance with the color information of each of the areas acquired at step (c);

(f) determining a type of a light source with which the subject is illuminated according to the luminance level of the subject determined at step (a) and the number of the areas belonging to the determination frame found at step (e); and

(g) adjusting a white balance according to the type of the light source determined at step (f).

2. The automatic white balance adjustment method as defined in claim 1, wherein:

the color information comprises a ratio R/G and a ratio B/G between R, G, B signals in each of the areas; and

the determination frame is specified by a range of the ratio R/G and a range of the ratio B/G.

3. The automatic white balance adjustment method as defined in claim 1, wherein:

the determination frame comprises a shade determination frame

indicating a color distribution range of a shade; and

the area belonging to the shade determination frame is restricted to the area of which luminance is not more than a predetermined luminance.

4. The automatic white adjustment method as defined in claim 3, wherein:

the determination frame comprises a blue sky determination frame indicating a color distribution range of a blue sky; and

the area belonging to the blue sky determination frame is restricted to the area of which luminance is not less than a predetermined luminance.

5. The automatic white balance adjustment method as defined in claim 4, wherein the step (f) comprises the steps of:

calculating an evaluation value expressing how much the subject appears in outdoor shade according to the following equation:

the evaluation value expressing how much the subject appears in outdoor shade = F(outdoor) × F(shade) × F(blue sky),

where F(outdoor) is a value of a membership function of which variable is the luminance level and F(outdoor) expresses how much the subject appears outdoors, F(shade) is a value of a membership function of which variable is the number of the areas belonging to the shade determination frame and F(shade) expresses how much the subject appears in shade, F(blue sky) is a value of a membership function of which variable is the number of the areas belonging to the blue sky determination frame;

determining that the type of the light source is outdoor shade when the evaluation value is not less than a predetermined value; and

determining that the type of the light source is daylight when the evaluation value is less than the predetermined value.

6. The automatic white balance adjustment method as defined in claim 5, further comprising the step of:

determining whether to flash an electronic flash according to the luminance level of the subject determined at step (a),

wherein the step (f) is performed only when it is determined not to flash the electronic flash, and the type of the light source is determined as the electronic flash when it is determined to flash the electronic flash.

7. The automatic white balance adjustment method as defined in claim 1, wherein:

the type of the light source comprises a shade, a fluorescent lamp and an electric bulb; and

the determination frames comprises a shade determination frame indicating a color distribution range of a shade, a fluorescent lamp determination frame indicating a color distribution range of a fluorescent lamp, an electric bulb determination frame indicating a color distribution range of an electric bulb, a blue sky determination frame indicating a color distribution range of a blue sky and a skin pigmentation determination frame indicating a color distribution range of a skin pigmentation.

8. The automatic white balance adjustment method as defined in claim 7, wherein the step (f) comprises the steps of:

calculating an evaluation value expressing how much the subject appears in outdoor shade, an evaluation value expressing how much the light source appears the fluorescent lamp, and an evaluation value expressing how much the light source appears the electric bulb according to the following equations:

the evaluation value expressing how much the subject appears in outdoor shade = F(outdoor) × F(shade) × F(blue sky);

the evaluation value expressing how much the light source appears the fluorescent lamp = F_1(indoor) × F(fluorescent lamp); and

the evaluation value expressing how much the light source appears the electric bulb = F_2(indoor) × F(electric bulb) × F(skin pigmentation),

where F(outdoor) is a value of a membership function of which variable is the luminance level and F(outdoor) expresses how much the subject appears outdoors, F(shade) is a value of a membership function of which variable is the number of the areas belonging to the shade determination frame and F(shade) expresses how much the subject appears in shade, F(blue sky) is a value of a membership function of which variable is the number of the areas belonging to the blue sky determination frame, F_1(indoor) is a value of a membership function of which variable is the luminance level and F_1(indoor) expresses how much the subject appears indoors and the light source is the fluorescent lamp, F_2(indoor) is a value of a membership function of which variable is the luminance level and F_2(indoor) expresses how much the subject appears indoors and the light source is the electric bulb, F(fluorescent lamp) is a value of a membership function of which variable is the numbers of the areas belonging to the fluorescent lamp determination frame and F(fluorescent lamp) expresses how much the light source appears the fluorescent lamp, F(electric bulb) is a value of a membership function of which variable is the numbers of the areas belonging to the electric bulb determination frame and F(electric bulb) expresses how much the light source appears the electric bulb, and F(skin pigmentation) is a value of a membership function of which variable is the numbers of the areas belonging to the skin pigmentation determination frame and F(skin pigmentation) expresses how much the subject appears to include the skin pigmentation;

determining, when a maximum one of the evaluation values is not less than a predetermined value, that the type of the light source is as the light source corresponding to the maximum one of the evaluation values; and

determining that the type of the light source is daylight when the maximum one of the evaluation values is less than the predetermined value.

9. An automatic white balance adjustment apparatus, comprising:

a luminance level determining device that determines a luminance level of a subject;

an image plane dividing device that divides an image plane, on which the subject is imaged, into a plurality of areas;

a color information acquiring device that acquires color information of each of the areas;

a determination frame setting device that sets at least one determination frame indicating at least a color distribution range of a light source;

a number of areas finding device that finds a number of the areas belonging to the determination frame in accordance with the color information of each of the areas acquired by the color information acquiring device;

a light source type determining device that determines a type of a light source with which the subject is illuminated according to the luminance level of the subject determined by the luminance level determining device and the number of the areas belonging to the determination frame found by the number of areas finding device; and

a white balance adjusting device that adjusts a white balance according to the type of the light source determined by the light source type determining device.

10. The automatic white balance adjustment apparatus as defined in claim 9, wherein:

the color information comprises a ratio R/G and a ratio B/G between R, G, B signals in each of the areas; and

the determination frame is specified by a range of the ratio R/G and a range of the ratio B/G.

11. The automatic white balance adjustment apparatus as defined in claim 9, wherein:

the determination frame comprises a shade determination frame indicating a color distribution range of a shade; and

the area belonging to the shade determination frame is restricted to the area of which luminance is not more than a predetermined luminance.

12. The automatic white adjustment apparatus as defined in claim 11, wherein:

the determination frame comprises a blue sky determination frame indicating a color distribution range of a blue sky; and

the area belonging to the blue sky determination frame is restricted to the area of which luminance is not less than a predetermined luminance.

13. The automatic white balance adjustment apparatus as defined in claim 12, wherein:

the light source type determining device comprises an evaluation value calculating device that calculates an evaluation value expressing how much the subject appears in outdoor shade according to the following equation:

the evaluation value expressing how much the subject appears in

outdoor shade = F(outdoor) × F(shade) × F(blue sky),

where F(outdoor) is a value of a membership function of which variable is the luminance level and F(outdoor) expresses how much the subject appears outdoors, F(shade) is a value of a membership function of which variable is the number of the areas belonging to the shade determination frame and F(shade)

expresses how much the subject appears in shade, F(blue sky) is a value of a membership function of which variable is the number of the areas belonging to the blue sky determination frame;

the light source type determining device determines that the type of the light source is outdoor shade when the evaluation value is not less than a predetermined value; and

the light source type determining device determines that the type of the light source is daylight when the evaluation value is less than the predetermined value.

14. The automatic white balance adjustment apparatus as defined in claim 13, further comprising:

an electronic flash controlling device that determines whether to flash an electronic flash according to the luminance level of the subject determined by the luminance level determining device,

wherein the light source type determining device operates only when it is determined not to flash the electronic flash, and the type of the light source is determined as the electronic flash when it is determined to flash the electronic flash.

15. The automatic white balance adjustment apparatus as defined in claim 9, wherein:

the type of the light source comprises a shade, a fluorescent lamp and an electric bulb; and

the determination frames comprises a shade determination frame indicating a color distribution range of a shade, a fluorescent lamp determination frame indicating a color distribution range of a fluorescent lamp, an electric bulb determination frame indicating a color distribution range of an electric bulb, a

blue sky determination frame indicating a color distribution range of a blue sky and a skin pigmentation determination frame indicating a color distribution range of a skin pigmentation.

16. The automatic white balance adjustment apparatus as defined in claim 15, wherein:

the light source type determining device comprises an evaluation value calculating device that calculates an evaluation value expressing how much the subject appears in outdoor shade, an evaluation value expressing how much the light source appears the fluorescent lamp, and an evaluation value expressing how much the light source appears the electric bulb according to the following equations:

the evaluation value expressing how much the subject appears in outdoor shade = F(outdoor) × F(shade) × F(blue sky);

the evaluation value expressing how much the light source appears the fluorescent lamp = F_1(indoor) × F(fluorescent lamp); and

the evaluation value expressing how much the light source appears the electric bulb = F_2(indoor) × F(electric bulb) × F(skin pigmentation),

where F(outdoor) is a value of a membership function of which variable is the luminance level and F(outdoor) expresses how much the subject appears outdoors, F(shade) is a value of a membership function of which variable is the number of the areas belonging to the shade determination frame and F(shade) expresses how much the subject appears in shade, F(blue sky) is a value of a membership function of which variable is the number of the areas belonging to the blue sky determination frame, F_1(indoor) is a value of a membership function of which variable is the luminance level and F_1(indoor) expresses how much the subject appears indoors and the light source is the fluorescent lamp, F_2(indoor) is a value of a membership function of which variable is the luminance level and

F_2(indoor) expresses how much the subject appears indoors and the light source is the electric bulb, F(fluorescent lamp) is a value of a membership function of which variable is the numbers of the areas belonging to the fluorescent lamp determination frame and F(fluorescent lamp) expresses how much the light source appears the fluorescent lamp, F(electric bulb) is a value of a membership function of which variable is the numbers of the areas belonging to the electric bulb determination frame and F(electric bulb) expresses how much the light source appears the electric bulb, and F(skin pigmentation) is a value of a membership function of which variable is the numbers of the areas belonging to the skin pigmentation determination frame and F(skin pigmentation) expresses how much the subject appears to include the skin pigmentation;

the light source type determining device determines, when a maximum one of the evaluation values is not less than a predetermined value, that the type of the light source is as the light source corresponding to the maximum one of the evaluation values; and

the light source type determining device determines that the type of the light source is daylight when the maximum one of the evaluation values is less than the predetermined value.